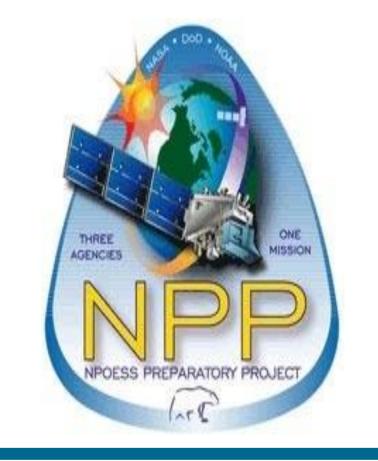


Cris Reprocessing Compute System

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Abstract

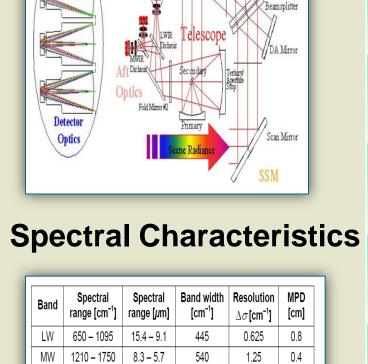
The Crosstrack Infrared Sounder (CrIS) is a Fourier transform spectrometer flying on-board the SUOMI NPP satellite that was launched on October 28th 2011. The primary mission is to provide IR radiance measurement of the top of atmosphere that is assimilated directly into the NWP weather forecasting system. Reprocessing capability has become needed for several reasons: (1) Estimation of new calibration parameters allows one to see the impact on the SDR product, (2) Data format change during the mission currently does not allow backward capability, (3) Data set of the mission can be reprocessed with the same algorithm version and calibration coefficients for end-to-end comparison, (4) Reprocessing of high resolution data. To this end, NOAA has set up a reprocessing system. In this presentation, we present the hardware architecture, software data flow, and examples of reprocessed normal mode resolution SDRs.

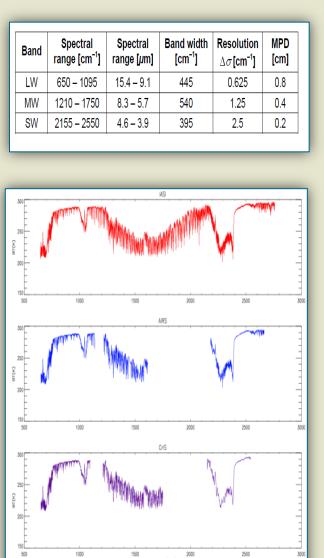
Instrument Characteristics and Attributes

Scan Line (2200 Km Swath)

Sample #1

CrIS Optical Schematic Interferometer **Spectral Characteristics**





Normal Acquisition

Mode Number of 9 Number of 30 FOR per Scan Line Scan line 8 seconds Acquisition Period Number of 10800 Scan line per

Band

Spectra per

8-second scan → 200 ms sweep slew 1 2 3 4 · · · 27 28 29 30 slew 31 31 slew 0 0 slew FR FR FR sweep direction Number of Frequency 8.7 Million number of

CrIS acquires 8.7 million - IASI has full spectral coverage from 645 cm-1 to spectra per day covering over 2760 cm-1. 95% of the Earth surface.

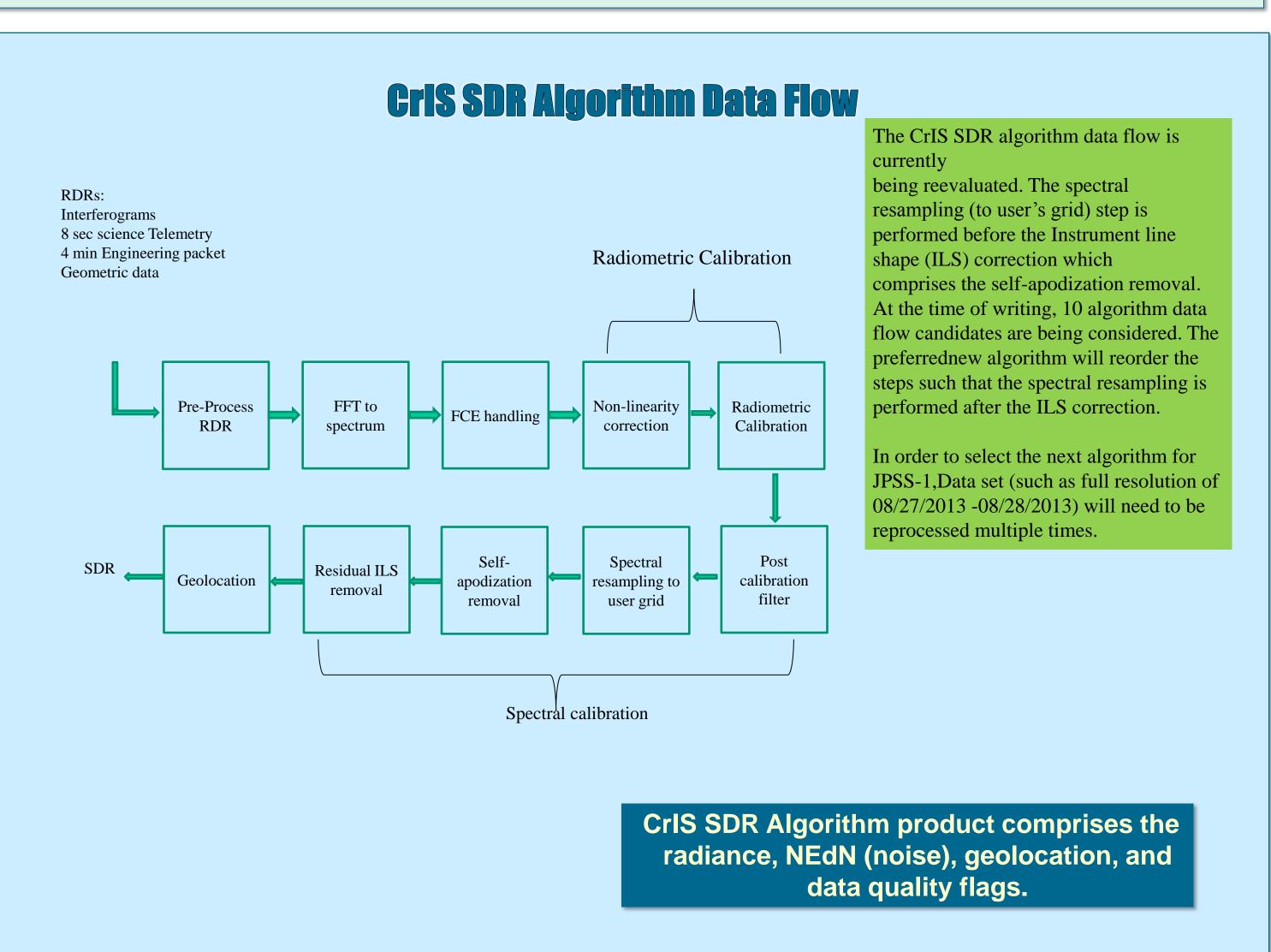
- AIRS and CrIS have 3 frequency bands as shown. - CrIS has coarser spectral resolution in MW and SW. Request to download full spectral resolution (0.625 cm-1 all 3 bands) is under consideration for JPSS-1 satellite (launch planned for 2017).

Field Of Regard

1 center, 4 side and 4

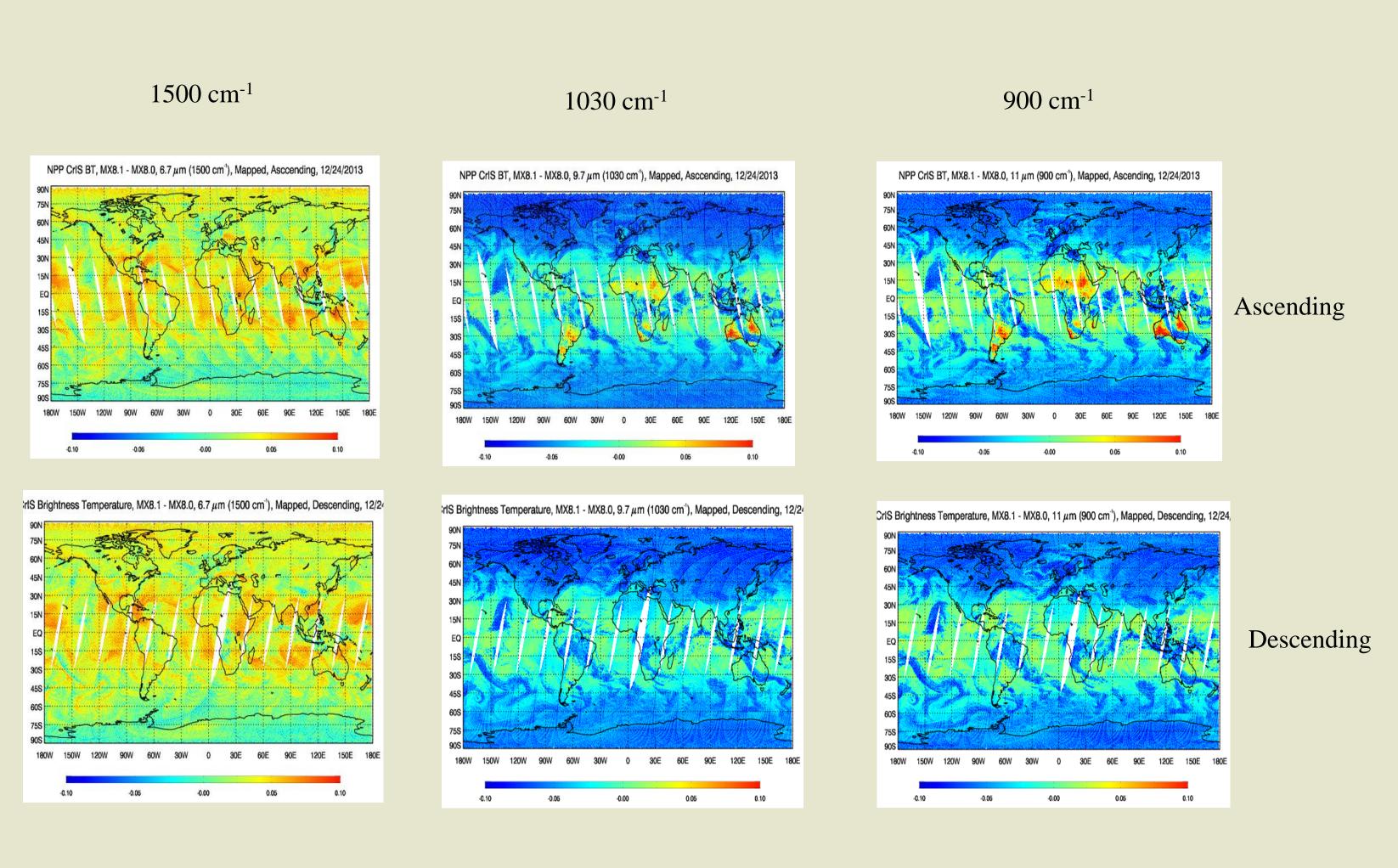
corner FOVs in each FOR

Motivation NPP CrlS Laser Wavelength: Measured/Monitored/Resampling, Daily Average The CRIS SDR algorithm has The CrIS instrument has been stable since the beginning of the mission(Feb 2012). changes since the beginning Shown here is the laser wavelength. of the mission. These changes focus on the science algorithm, refinements of the calibration parameters, bug fixes, the data quality flags tree logic, and threshold **Provisional status since Jan 31,** parameters tuning. To be done 2013 Therefore, the current CrIS **SDR product does not have** continuity of the science Mx8.1/8.2 product and the data quality 2013-07-10 •Geo bug fixed flags. Reprocessing will • Imgy rad. DQF implemented •MW Imgy limit lifted to 0.88 • FOV5 ILS equation error allow to have the entire CrIS •Time stamp fix for monthly Non-linearity equation initial CMO saved SDR product to conform to • Full-res truncation module • Lunar intrusion flag bug •Time stamp overflow bug fixed the same software version. Bit-trim table stored in CMO Mx6.3/6.4 • One-scan shift of reference Mx8.0 •FIR coefficients are updated Handling Missing pixel/scan 2013-11-14 • Handling short granule Handling invalid Geolocation



Reprocessing Data Flow Top Level Script - CLASS: Comprehensive Large Array-data Staging, Scheduling, Controlling, Archiving Stewardship System hold all the mission Comprehensive Large Array-Data Stewardship System hold NOAA operational Mission data includes S-NPP, GEOS-M, NOAA-18, NOAA-19 and many others. -SCDR: NOAA repository for mission data, The facilities are located in Asheville, NC, USA 300 TB, database query based on time and RDR Manipulator - RDR Manipulator : Can modify the engineering packet values (calibration coefficients such as non-linearity, threshold values, and more). **SDR Processing** SDR -SDR processing is version controlled. It (ADL) CLAS Output has 2 main option modes: 1) parallel **SCDR** RHS1002 processing can utilize multiple CPU, 2) serial processing utilize one CPU. RHW1049 The handling of the CMO matrix is straightforward in the serial mode, the CMO Offline Processing matrix is computed sequentially. In the Offline -RDR Reader parallel mode, the CMO might change on -TVAC Analysis Tools Output one CPU while the other CPU is computing SCDR is a data-array server that holds up a granule at later time. Therefore, that to 6 months of CrIS data. It is easily second CPU needs to acquire the latest accessible CMO and to recompute some of the with query script. For example, the list of previous granules (tricky!). CrIS SDR product file of 1/15/2014 can be accessed with the command: Scdr –files –t SCRIS 20140115 SCRD is directly visible to RHS1002 and The TOP-LEVEL-SCRIPT (TLS) is the brain of the reprocessing system. The nominal RHW1049. granularity is one day. The TLS will stage the data from SCDR to either RHS1002 or RHW1049. If the data are missing, the user will need to download the data from CLASS bypassing SCDR. The second step is Scheduling using the crontab utility. The third step is to control (select) which executable to - Red Hat Enterprise Linux Client be processed. Once the processing is done, the TLS will then archive the results into a well release 5.10 (Tikanga) designed directory tree structure. The CrIS SDR product will then be available for further RHS1002 - 64 GB RAM - Dual CPU, Quad Core, Xeon®, E5620 @2.40 GH: processing such as Statistical analysis, validation (obs-calc, SNO), or be used by the EDR algorithm for atmospheric retrieval. - Red Hat Enterprise Linux Server release 6.5 (Santiago) RHW1049 -256 GB RAM -QuadCPU, 10 Core, Xeon®, E7-4780 @2.40 GHz The CrIS Reprocessing System can reprocess the entire mission data set.

Example of Reprocessing: MX8.1-MX8.0 on 12/24/2013



One year of data were reprocessed using the new non-linearity coefficients and the new ILS parameters that will be part of MX 8.1 operational software (will be available on Feb. 20th 2014). However, MX8.1 results will not be available to the users prior to Feb 17th 2014. The added value of reprocessing is to obtain a long time series of the same software (and calibration coefficients) that is continuous in time without discontinuity in the data time series.

In the example above, MX 8.1 minus MX8.0 is shown for December 24th 2013. There is up to 0.1 K difference in brightness temperature in the warm regions.

Data reprocessing can show the difference between algorithms. Here, the difference between MX 8.1 and MX 8.0 is shown.

Summary

- > The CrIS SDR reprocessing system is needed for further algorithm development.
- > It allows the calculation of the impact of new formulation or calibration coefficients.
- > Reprocessing is needed for establishing a climate record.

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